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The genus *Nabidomiris* (Hemiptera: Heteroptera: Miridae): review of the species and description of a new species from South Africa

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Abstract. *Nabidomiris* Poppius, 1914 is an African plant bug genus with three described species. Here we describe as new a fourth, *Nabidomiris natalensis* sp. nov. from KwaZulu-Natal (South Africa), and compare it to the other known species. Because male genitalia are important for species delimitation, and it has never been documented for any of the species of *Nabidomiris*, we describe for the first time the male genitalia of *N. clypealis* Poppius, 1914, *N. longipennis* Odhiambo, 1958, and *N. giloicus* Linnavuori, 1975. We provide a key to separate all species, and new country records for the previously described species. *Nabidomiris clypealis* is recorded for the first time from the Democratic Republic of the Congo and South Africa, *N. giloicus* from Cameroon, and *N. longipennis* from Tanzania.

Key words. Heteroptera, Miridae, Mirinae, Stenodemini, taxonomy, key, new species, South Africa, Afrotropical Region

Introduction

Nabidomiris Poppius, 1914 is a mirine plant bug genus belonging to the tribe Stenodemini (Schwartz 2008). The genus currently includes three described species, *Nabidomiris clypealis* Poppius, 1914, *N. longipennis* Odhiambo, 1958, and *N. giloicus* Linnavuori, 1975, distributed in the Afrotropical Region. The biology of the species remains mostly unknown, with unspecific references such as its feeding on grasses in East Africa (Schwartz & Schuh 2016).

Nabidomiris was erected by Poppius (1914), to include one new species, *N. clypealis* from Victoria Nyanza, on Lake Victoria. The genus was not mentioned again, until Odhiambo (1958) described *N. longipennis* from Uganda. Later, Linnavuori (1975) described *N. giloicus* from southern Sudan (now South Sudan). Other than the original descriptions, no recent treatments for the genus are available.

Schwartz (2008) conducted a phylogenetic analysis of the Stenodemini genera, in which he found *Collaria* Provancher, 1872 to be the sister group of *Nabidomiris*. Although he included the three known species in his study, he provided only selected micrographs and illustrations of the endosoma, posterior wall, and dorsal labiate plate of male and female genitalia, for an undescribed one. In this work, we formally describe this species as new, provide as documentation micrographs of the male genitalia of all species for the first time, a key to all species, and information concerning geographic distribution including new country records.

Material and methods

Measurements were made on Zeiss Discovery V20 stereomicroscopy (Table 1). From the measurements taken, it is evident that the ratio between basal margin of pronotum and head width is useful to separate the four species. However, the usefulness of this ratio for separating species within *Nabidomiris* must be taken with caution, because we did not fully assess intraspecific variation or sexual dimorphism, and should be later confirmed studying more specimens given the limited material available for study.

A Zeiss Discovery V20 stereomicroscopy adapted with a Zeiss AxioCam MRc digital camera, and Olympus BX53 microscopy with an Olympus DP73 camera were used to obtain photographs. Final images were combined for a better focus. For genitalic dissections, the whole abdomen (male and female) was removed and immersed in a warm solution of 85% lactic acid, rinsed in distilled water and transferred to 70% ethanol for final dissection under a Leica MZ8 stereomicroscope.

We follow the terminology of Schuh & Slater (1995) for the general external morphology. For male and female genitalia we follow Schwartz (2008) and Morales et al. (2016).

Localities were obtained from label data, and georeferenced using gazetteers (http://www.fallingrain.com) and Google Earth. Political divisions, such as country names, were updated to reflect recent changes. The software QGIS (2.8.2) was employed to generate the geographic distribution map. All inferred data are placed between square brackets.

Material from the following collections was examined:

AMNH American Museum of Natural History, New York, USA;
BMNH The Natural History Museum [former British Museum (Natural History)], London, United Kingdom;
CASC California Academy of Sciences, San Francisco, USA;
NMSA Natal Museum South Africa, Pietermaritzburg, South Africa.

Taxonomy

Nabidomiris Poppius, 1914

Nabidomiris Poppius, 1914: 125. Type species. *Nabidomiris clypealis* Poppius, 1914, by monotypy.
Nabidomiris: Carvalho (1959): 295 (catalog); Linnavouri (1973): 71 (list); Schuh (2013) (catalog).

Generic diagnosis. This genus is recognized by having the anteocular portion of head longer than one-half the head length; the dorsal portion of clypeus produced and bulbose; eyes small, widely separated from the head; proepisternum strongly rounded; secondary gonopore diffusely spinose and with a sclerite; female genitalia with small and closed sclerotized rings; pretarsus with pulvillus and peritremal disk present (Schwartz 2008).

Nabidomiris is very similar to *Collaria* (Schwartz 2008), which also occurs in the Afrotropical Region (Schwartz 2008, Morales et al. 2016), but it can be easily separated from it by having the relative length of the anteocular region longer than one-half the length of the head.

Identification key to the species of *Nabidomiris*

This key is intended to be used with male specimens. Dissection of the genitalia may be required to correctly identify a species with this key.

1 Pronotum with two dark spots on the humeral region (Figs 1, 2, 3). 2
– Pronotum not colored as above (Fig. 4). ..... ***N. natalensis* sp. nov.**
2 Clypeus darkened or with large dark spots (Fig. 3); basal margin of pronotum more than 1.5 times the width of the head. ..... ***N. longipennis*** Odhiambo, 1958
– Clypeus pale, not dark (Fig. 2); basal margin of pronotum less than 1.4 times the width of the head. 3
3 Hemelytra in male long, membrane normally developed (Fig. 1); ribbon-like sclerite of male endosoma wide (Fig. 5, *rs*), medial sclerite not present (Fig. 6). ..... ***N. clypealis*** (Poppius, 1914)
– Hemelytra in male short, with membrane reduced (Fig. 2); ribbon-like sclerite of male endosoma narrow (Fig. 7); medial sclerite oval and smooth (Fig. 7, *ms*). ..... ***N. giloicus*** Linnavuori, 1975

Nabidomiris clypealis Poppius, 1914

(Figs 1, 5, 6, 21)

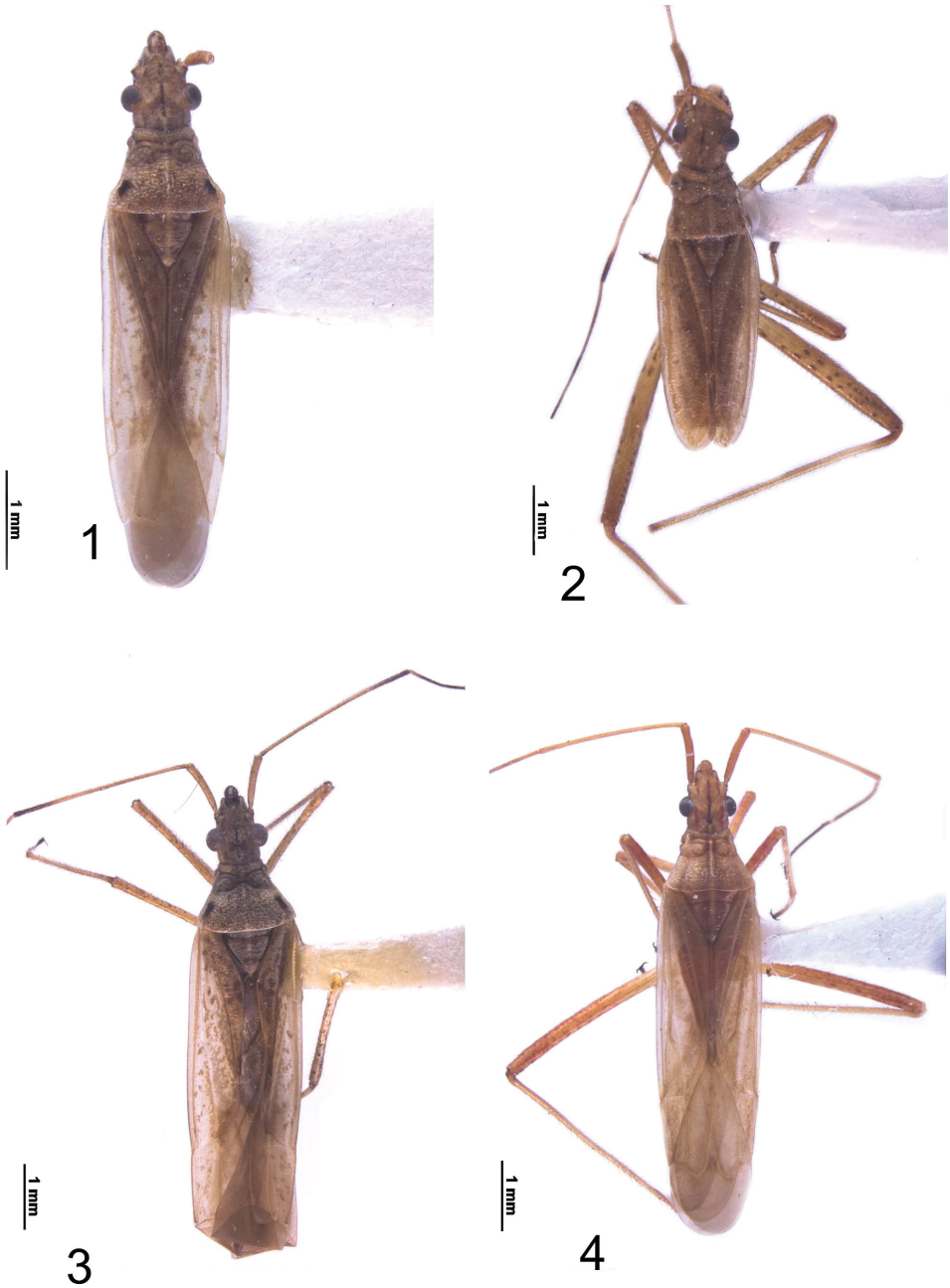
Material examined. DEMOCRATIC REPUBLIC OF THE CONGO: 1 ♀, [SUD-KIVU / LWIRO] / River Km 47 / N. of Bakavu / 1650 m. / [2° 13' 55S 28° 47' 11E] / 1.iv.1958 / E.S. Ross and R.E. Leech (CASC). **SOUTH AFRICA:** 1 ♂, '[NORTH WEST / RUSTENBURG]: Rustenburg U. So. Afr / [26° 00' 00" S; 30° 00' 00" E] / 23.i. 1974 / Ashley B. Gurney' (AMNH).

Diagnosis. Recognized by the following combination of characters: basal margin of pronotum about 1.4 times the width of the head (Table 1), humeral angles with two rounded black spots (Fig. 1); males macropterous, hemelytra sometimes reduced in females, apices reaching only the penultimate segment of the abdomen; male endosoma with a wide ribbon-like sclerite with wide base (Fig. 5, *rs*), ventral right sclerite fusiform (Fig. 6, *vrs*).

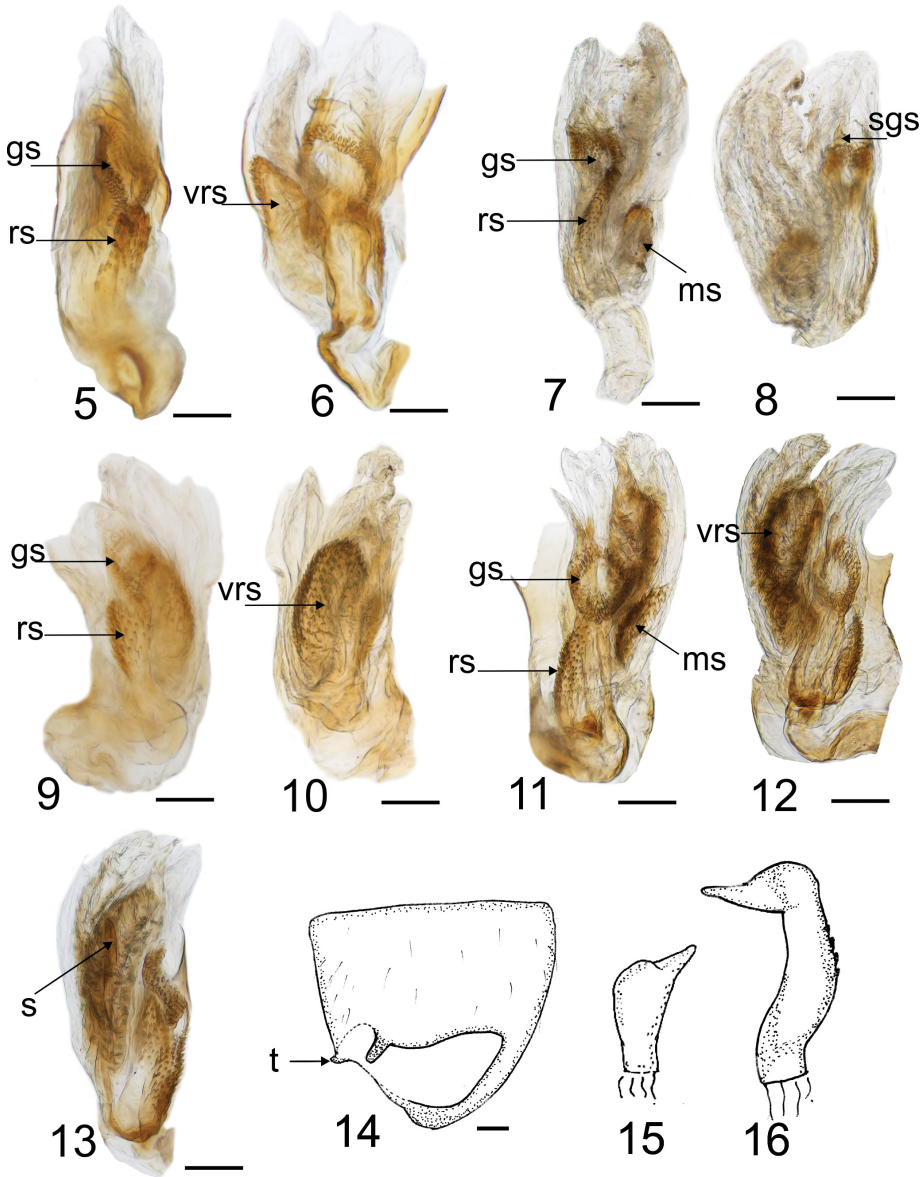
Male genitalia. Pygophore elongated with apex semi-triangular and a tubercle on left latero-posterior ventral margin. Parameres: left paramere sickle-shaped, ending in lateral tip, right paramere with basal sensory lobe straight. Endosoma ribbon-like sclerite (*rs*) wide with broad base, trichiae on surface medium-sized (Fig. 5); median sclerite (*ms*) absent; ventral right sclerite (*vrs*) fusiform with microtrichia on margin of sclerite (Fig. 6).

Plant associations. Unknown. Vayssières et al. (2001) mentioned *N. clypealis* as a predatory species on Solanaceae vegetable crops. Given the little known biology of *Nabidomiris* this might be surprising, but further observations are needed to confirm the predatory behavior or at least rule out facultative predatory habits.

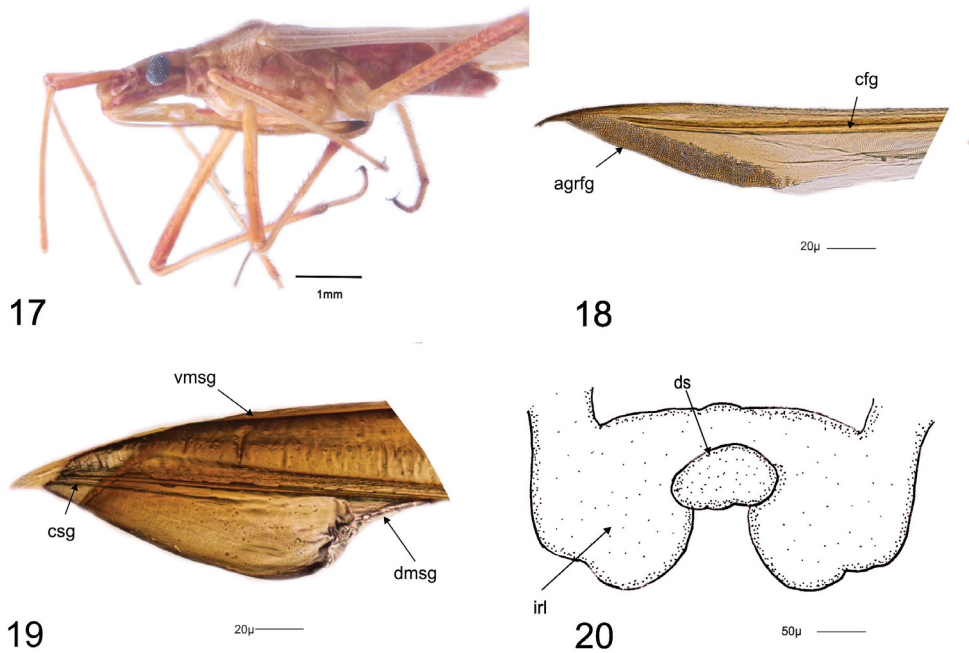
Distribution. Described originally from Victoria Nyanza, Morrukku near Bukoba (nowadays Tanzania) (Poppius 1914). New records from the Democratic Republic of the Congo and South Africa (Fig. 21) are provided here. If correctly identified, Vayssières et al. (2001) record from



Figs 1–4. *Nabidomiris* spp., dorsal habitus of male. 1 – *N. clypealis* Poppius, 1914, 2 – *N. giloicus* Linnavuori, 1975, 3 – *N. longipennis* Odhiambo, 1958, 4 – *N. natalensis* sp. nov.



Figs 5–16. 5–10 – *Nabidomiris* spp., male endosoma. 5–6 – *N. clypealis* Poppius, 1914: 5 – left lateral view, 6 – right lateral view; 7–8 – *N. giloicus* Linnavuori, 1975: 7 – left lateral view, 8 – right lateral view; 9–10 – *N. longipennis* Odhiambo, 1958: 9 – left lateral view, 10 – right lateral view. 11–16 – *N. natalensis* sp. nov., male genitalia: 11 – left lateral view; 12 – right lateral view; 13 – ventral view; 14 – pygophore, dorsal view; 15 – right paramere; 16 – left paramere. Scale bars: 1 mm. Abbreviations: gs – secondary gonopore, ms – medial left sclerite, rs – ribbon-like sclerite, s – spicule of endosoma, sgs – sclerite of the secondary gonopore, t – tubercle on ventral left margin of pygophore, vrs – ventral right sclerite.



Figs 17–20. *Nabidomiris natalensis* sp. nov. 17 – male lateral view. 18–20 – female genitalia: 18 – apex of first gonapophysis in lateral view; 19– apex of second gonapophysis in lateral view; 20 – posterior wall. Abbreviations: agrfg – apical grooved region of first gonapophysis, cfg – carina of first gonapophysis, csg – carina of second gonapophysis, dmsg – dorsal margin of second gonapophysis, ds – dorsal structure of posterior wall, irl – interramal lobe of posterior wall, vmsg – ventral margin of second gonapophysis.

La Reunion would imply a more widespread distribution into the Indian Ocean. The wide distributional gap between localities in central Africa and the one in South Africa indicate a potential occurrence of this species between these areas.

Nabidomiris giloicus Linnavuori, 1975

(Figs 2, 7, 8, 21)

Type material examined. Holotype: ♂, '**SUDAN** / EQUATORIA / Imatong Mts nr. / Gilo 18-24.iii.1963 / Linnavuouri' (AMNH) [photo examined].
Additional material examined. CAMEROON: 1 ♂, '[SUD-OUEST] / Br. Cameroons Sasse-Sappo / [4° 6' 46N; 9° 13' 47E] / 20-31.i.1952 / Tita' (CASC).

Diagnosis. Recognized by the following combination of characters: basal margin of pronotum about 1.2 times the width of the head (Table 1), humeral angles with two rounded black spots; (male) hemelytra reduced (brachypterous) (Fig. 2); male endosoma with ribbon-like sclerite long and narrow (Fig. 7, *rs*); medial left sclerite oval and smooth (Fig. 7, *ms*), and sclerite of the secondary gonopore present (Fig. 8, *sgs*).

Male genitalia. Pygophore and parameres lost [specimen already dissected when examined]. Endosoma: ribbon-like sclerite (*rs*) long and narrow, trichiae on surface very small (Fig.7); medial sclerite (*ms*) oval and smooth (Fig. 8); and sclerite of the secondary gonopore present (Fig. 8, *sgs*).
Plant associations. Associated with *Podocarpus* (Podocarpaceae) (Linnavuori 1975).
Distribution. Described from South Sudan (Linnavuori 1975). New country record from Cameroon in western Africa (Fig. 21).

Nabidomiris longipennis Odhiambo, 1958

(Figs 3, 9, 10, 21)

Material examined. Allotype: ♀, '**UGANDA** / KAWANDA / 14.v.1958 / T.R. Odhiambo' (BMNH) [photo examined].
Additional material examined. DEMOCRATIC REPUBLIC OF THE CONGO: 4 ♂♂ 1 ♀, '[SUD-KIVU]: Lwiro / River Km 47 / N. of Bakavu / 1650 m. / [2° 13' 55S, 28° 47' 11E] / 15.vii.1957 / E.S. Ross and R.E. Leech' (CASC). **TANZANIA:** 1 ♂, '[MKOAWA MOROGORO] / Mlimba / [8° 48' 0S, 35° 49' 0E] / xi. 1967 / I.A.D. Robertson' (AMNH).

Diagnosis. Recognized by the following combination of characters: basal margin of pronotum about 1.55 times the width of the head (Table 1), humeral angles with two rounded black spots; macropterous in both sexes (Fig. 3); male endosoma with a wide ribbon-like sclerite with narrow base (Fig. 9, *rs*), ventral right sclerite ovoid (Fig. 10, *vrs*).
Male genitalia. Pygophore: elongated with apex semi-triangular and a tubercle on left lateroposterior ventral margin. Parameres: left paramere sickle-shaped, ending in lateral tip, right paramere with hypophysis curved. Endosoma: ribbon-like sclerite (*rs*) wide with narrow base, trichiae on surface medium-sized (Fig. 9); median sclerite (*ms*) absent; ventral right sclerite (*vrs*) ovoid, entire surface covered with microtrichiae (Fig. 10).
Plant associations. Unknown.
Distribution. Described originally from Uganda (Odhiambo 1958) and recorded from the Democratic Republic of the Congo in central Africa (Linnavuori 1973). New country records from Tanzania in eastern Africa (Fig. 21).

Nabidomiris natalensis sp. nov.

(Figs 4, 11–21)
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Nabidomiris sp.: Schwartz (2008): Figs 39, 40 (E–H), 41 (K–M).

Type material. Holotype: ♂, **SOUTH AFRICA:** '[KWAZULU]-NATAL / Giants Castle Park: / [29° 20′ 0″ S; 29° 29′ 0″ E] / 5800 ft. / 6.iii.1968 / T. Schuh, JA Slater M. Sweet' (AMNH). Paratypes: 21 ♂♂ 25 ♀♀, same data as holotype (AMNH); 1 ♀, 'TRANSVAAL [without specific data] / [26° 00' 00" S; 30° 00' 00" E] / 23.i. 1974 / Ashley B. Gurney' (AMNH). 1 ♂, 'KWAZULU-NATAL / Giants Castle Park / [29° 20′ 0″ S; 29° 29′ 0″ E] / 5-11. xii.1983 / JGH Londt' (NMSA).

Description. ***Male.*** *Coloration*. Brown (Fig. 4). Head brown, with a median longitudinal red line on frons, and paired lateral longitudinal red lines at the base of antennal tubercles; vertex with paired lateral longitudinal red lines running from inner margin of the eyes to the base of the head; eye brown; broad red longitudinal line on lateral side of the head from

Table 1. Measurements for specimens of *Nabidomiris* species. Ant I – antennal segment I, Ant II – antennal segment II, Ant III – antennal segment III, Ant IV – antennal segment IV, Pron – pronotum, Lab – labium, Scut – scutellum, HFem – hind femur, HTib – hind tibia, HTar – hind tarsus, IntOcDi – interocular distance.

	Length													Width				
	Body	Head	Ant I	Ant II	Ant III	Ant IV	Pron	Cune-us	Lab	Scut	HFem	HTib	Htar	Body	Head	Int-OcDi	Pron	Cune-us	Scut
Species																			
Nabidomiris clypealis																			
Female (n = 1)	5.96	1.36	0.91	2.47	1.76	1.25	1	0.62	2.99	0.6	1.92	3.69	0.77	1.71	1.02	0.47	1.24	0.31	0.52
Male (n = 1)	5.64	1.02	0.62	–	–	–	0.86	0.65	2.33	0.55	–	–	–	1.33	0.82	0.42	1.18	0.32	0.6
Nabidomiris giloicus																			
Male (n = 1)	5.18	1.25	0.97	2.97	2.05	–	0.96	0.47	3.65	0.61	2.79	3.47	–	1.45	0.94	0.53	1.17	0.23	0.59
Nabidomiris longipennis																			
Male (n = 1)	7.25	1.23	0.77	2.63	–	–	1.01	1.13	3.01	0.66	–	–	–	1.75	0.98	0.43	1.53	0.52	0.75
***Nabidomiris natalensis* sp. nov**																			
Female (n = 1)	7.87	1.31	0.81	2.16	2.14	1.1	0.99	1.14	3.48	0.84	3.18	2.99	0.37	1.87	0.92	0.55	1.54	0.51	0.96
Male (n = 1)	6.72	1.05	0.8	2.09	1	0.87	0.86	0.88	2.76	0.78	2.6	3.23	0.83	1.51	0.79	0.41	1.27	0.44	0.79

posterior margin of eye to base of head; broad red longitudinal line on lateral side of the head from maxillary plate to base of head; mandibular plate (Fig. 17), mandibular plate and apex of buccula brown; labium yellowish with apex black; clypeus brown; antennal segments brown, segment I reddish. Thorax: pronotum and collar brown; medial longitudinal line pale from anterior margin of pronotum to midpoint of posterior pronotal lobe; medial region of calli red brown; proepisternum brown; scutellum with pale yellow longitudinal line and pale apex. Hemelytra brown; legs pale brown; pro- and mesocoxa dark brown with pale spots; metacoxa red dark brown to pale apically; trochanter pale brown; femur reddish brown with spots; tibia pale brown and tarsus brown. *Vestiture and Structure*. Head: antenna with short erect setae, segment I slightly thickened (approximately twice the width of segment II, see Table 1), remaining segments thin and cylindrical. Antennal segment II 2.0 times longer than I (Table 1). Thorax: Pronotum with golden pilosity long, sparse and semi-erect. Basal margin of pronotum at least 1.67 times the width of head. *Measurements*. See Table 1. *Genitalia.* Pygophore elongated with apex semi-triangular, small tubercle on left lateral ventral margin and medium-sized tubercle on left dorsal margin of aperture (Fig. 14). Parameres: left paramere with dorsal and ventral margins of basal sensory lobe almost straight, sickle-shaped, ending in lateral tip (Fig. 16); right paramere short, as in Fig. 15. Endosoma: ribbon-like sclerite long and narrow, microtrichiae on surface medium sized (Fig. 11, *rs*); medial sclerite fusiform with microtrichiae on surface (Fig. 11, *ms*); ventral right sclerite ovoid with microtrichiae on margin (Fig. 12, *vrs*); ventral area with a short, longitudinal spicule (Fig. 13, *s*).

Female. Similar to male in color and size, but slightly longer. *Measurements*: Table 1. *Genitalia:* First gonapophysis with broad apical grooved region (Fig. 18, *agrfg*). Second gonapo-

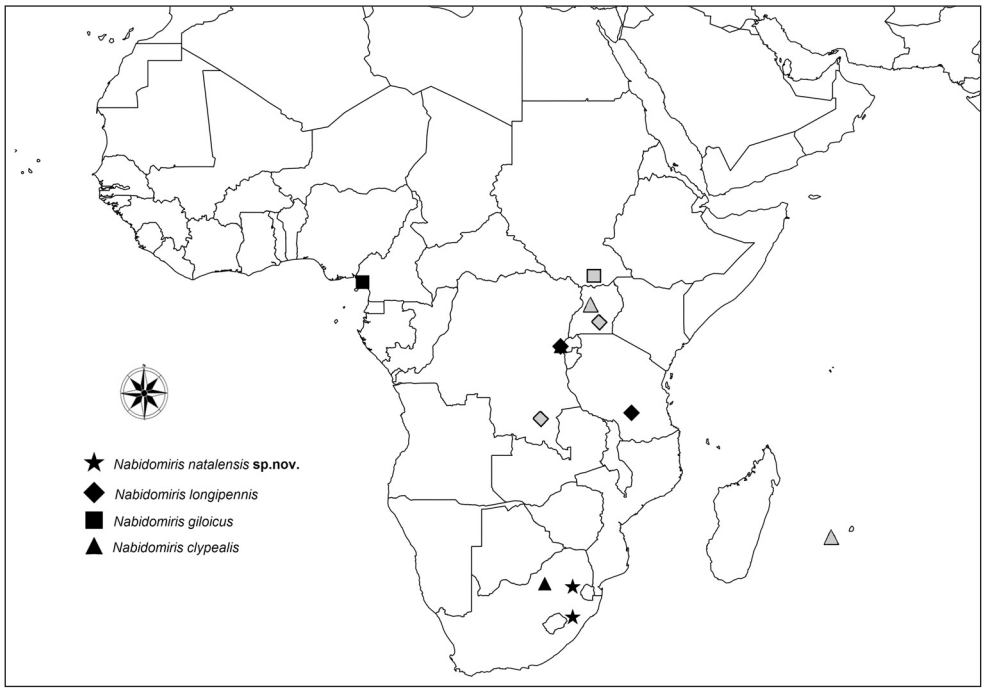

Fig. 21. Distribution map for species of *Nabidomiris*. Black symbols represent data from specimens examined; grey symbols represent data taken from the literature.

physis with ventral margin sclerotized and smooth (Fig. 19, *vmsg*); dorsal margin membranous (Fig. 19, *dmsg*); carina single, reaching the apex of second gonapophysis (Fig. 19, *csg*), with apex triangular (Fig. 19). Dorsal labiate plate with one small sclerite laterocaudad to sclerotized rings; posterior wall with subquadrate interramal lobes (Fig. 20, *irl*); dorsal structure small and medial process absent (Fig. 20, *ds*).

Diferential diagnosis. *Nabidomiris natalensis* sp. nov. can be distinguished by the pronotum without spots on the humeral region; basal margin of pronotum at least 1.67 times the width of head; endosoma with medial sclerite fusiform, ventral right sclerite ovoid and short longitudinal spicule on ventral area.

This new species is more similar to *N. clypealis* with regard to the general aspect of the body, the male genitalia, and the presence of a tubercle on the ventral left margin of the aperture of the pygophore. *Nabidomiris natalensis* sp. nov. can be distinguished from *N. clypealis* because in addition to the tubercle on the ventral margin of the pygophore, it also has a medium-sized tubercle on the left dorsal margin of the genital aperture which is not present in *N. clypealis*.

The endosoma of the males of the species of *Nabidomiris* has four endosomal sclerites: a ribbon-like sclerite (*rs*), medial sclerite (*ms*), ventral right sclerite (*vrs*), and a sclerite on its ventral surface (*sgs*); *N. natalensis* sp. nov. has an additional short longitudinal spicule (Fig. 13, *s*), apparently unique among the species of *Nabidomiris*.

The coloration of the body is similar in the three previously described species of *Nabidomiris* (Figs 1–3), in which the pronotum has paired dark spots on the humeral angles and the hemelytra has large brown spots (Linnavuori 1975, Odhiambo 1958). *Nabidomiris natalensis* sp. nov., however, differs by having the pronotum uniformly colored, without dark spots on the humeral angles, and by having the head with a median longitudinal red line, and coloration which differs strikingly from that of the other species.

Etymology. The species name *natalensis* (*-is*, *-e*) is an adjective referring to the Natal region in South Africa, nowadays KwaZulu-Natal, where most of the specimens were collected.

Plant associations. Unknown.

Distribution. This new species is known only from South Africa (KwaZulu-Natal and Transvaal) (Fig. 21).

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